



CHARACTERIZATION OF THE SHARK AND REEFFISH BOTTOM LONGLINE  
FISHERY: 2011

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<sup>1</sup> In memoriam



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## Introduction

Observations of the shark-directed bottom longline fishery in the Atlantic Ocean and Gulf of Mexico have been conducted since 1994 (e.g. Hale et al. 2011 and references therein). Currently about 220 U.S. fishers are permitted to target sharks (excluding dogfish) in the Atlantic Ocean and Gulf of Mexico, and an additional 259 fishers are permitted to land sharks incidentally. Amendments to the Consolidated Atlantic Highly Migratory Species Fishery Management Plan amendments implemented a shark research fishery, which allows NMFS to select a limited number of commercial shark vessels on an annual basis to collect life history data and catch data for future stock assessments (NMFS, 2007). Specifically, only commercial shark fishers participating in the research fishery are allowed to land sandbar sharks, *Carcharhinus plumbeus*, and must carry an observer on 100% of all trips (compared to a target coverage level of 4-6% outside the research fishery). Outside the research fishery, fishers are permitted to land 33 non-sandbar large coastal sharks per trip (including blacktip shark, *Carcharhinus limbatus*, bull shark, *Carcharhinus leucas*, lemon shark, *Negaprion brevirostris*, nurse shark, *Ginglymostoma cirratum*, silky shark, *Carcharhinus falciformis*, spinner shark, *Carcharhinus brevipinna*, tiger shark, *Galeocerdo cuvier*, great hammerhead shark, *Sphyrna mokarran*, scalloped hammerhead shark, *Sphyrna lewini*, and smooth hammerhead shark, *Sphyrna zygaena*).

The commercial reef fish fishery is an important fishery in the Gulf of Mexico. It involves 819 permitted vessels that target groupers, snappers, and other reef fish species. There is also a subset of these vessels that hold an eastern Gulf reef fish bottom longline endorsement, allowing them to use bottom longline gear deeper than 35 fathoms (64

meters) in the eastern Gulf of Mexico. Of these permitted vessels, approximately 6% have both reef fish and directed shark permits. Thus, overlap occurs among longline vessels in both shark directed and reef fish fisheries, necessitating observer coverage in both fisheries.

Herein, we report on fishing activities in the bottom longline fishery for the 2011 fishing season, including coverage of the 2011 shark research fishery.

## **Methods**

In September 2010, NMFS announced its request for applications for the shark research fishery from commercial shark fishers with a directed or incidental permit for 2010. Commercial shark fishers submitted applications to the Highly Migratory Species (HMS) Management Division. The HMS Management Division provided a list of qualified applicants to the Panama City Laboratory and based on the temporal and spatial needs of the research objectives, the availability of qualified applicants, and the available quota, ten (10) qualified applicants were selected for observer coverage. These vessels carried observers on 100% of trips. Outside the research fishery and depending on the time of year and fishing season, vessels that targeted shark or reef fish, possessed current valid directed shark and reef fish permits, and reported fishing with longline gear in the previous year were randomly selected for coverage with a target coverage level of 2-3% for shark directed trips and 8% for reef fish directed trips. Vessels were selected from two fishing regions: southern Atlantic Ocean and Gulf of Mexico. The southern Atlantic Ocean was defined from the east coast of Florida through North Carolina and the

Caribbean, and the Gulf of Mexico was defined from Texas through the west coast of Florida including the Florida Keys (NMFS, 2005).

Selection letters requiring observer coverage were issued to the permit holder via U.S. Certified mail approximately one month prior to the upcoming fishing season. Once the permit holder receives the selection letter, he or she is required to make contact with the observer coordinator and indicate intent to fish during the upcoming fishing season. If the permit holder intended to fish, the observer coordinator deployed an observer to the port of departure. Vessels were required to pass a Coast Guard Vessel Safety Examination as well as a safety evaluation by the observer prior to coverage.

While onboard the vessel, the observer completes three data forms: Longline Gear Characteristic Log, Longline Haul Log, and Individual Animal Log. The Longline Gear Characteristic Log is used to record gear characteristics. The Longline Haul Log is used to record the information on set and haulback, as well as environmental information. The Individual Animal Log records all species caught, condition of the catch (e.g. alive, dead, damaged, or unknown), and the final disposition of the catch (e.g. kept, released alive, discarded dead, etc.).

On shark research fishery trips, observers were required to randomly sample sharks, especially sandbar and blacktip sharks, for biological samples for updates to life history studies, which was a research recommendation from the last large coastal shark stock assessment (SEDAR 11). Observers were also required to obtain trip weighout forms which were compared to shark dealer reports by quota monitoring managers to manage the sandbar shark quota within the research fishery.

## Results

From January to December 2011, a total of 139 trips (defined as from the time a vessel leaves the port until the vessel returns to port and lands catch, including multiple hauls therein) on 20 vessels with a total of 465 bottom longline hauls (defined as setting gear, soaking gear for some duration of time, and retrieving gear) were observed (Table 1). Gear characteristics of trips varied by area (Gulf of Mexico or the U.S. Atlantic Ocean) and target species (grouper/snapper (reef fish), non-sandbar large coastal shark, or sandbar shark). In several cases, the universe of vessels covered was less than three vessels in each area and the observed data were combined for the Gulf of Mexico and U.S. Atlantic Ocean to protect confidentiality of vessels. The data were grouped by targets into three groups: a) hauls targeting reef fish in the Gulf of Mexico, b) hauls targeting non-sandbar large coastal shark species in the Gulf of Mexico and South Atlantic, and c) hauls targeting sandbar shark in the Gulf of Mexico and South Atlantic (Figure 1). No trips were observed in the northern U.S. Atlantic Ocean; therefore subsequent references to the “U.S. Atlantic Ocean” refer to the coastal waters off the southern U.S. Atlantic states from North Carolina to Florida (Richards, 1999).

### *a) Gulf of Mexico reef fish targeted trips*

#### *i) Gear and haul characteristics*

There were 241 hauls on 10 trips observed targeting reef fish (mainly red grouper, *Epinephelus morio*) in the Gulf of Mexico. Trips averaged 11.2 sea days in length. The mainline length ranged from 1.9 to 9.6 km with an average of 7.0 km. The bottom depth fished ranged from 40 to 270 m with an average of 74 m, and the number of hooks ranged from 197 to 975 hooks with an average of 718 hooks fished. Circle hooks sized 14.0 were used 49.4% of the time, while circle hooks sized 13.0 were used 35.3% of the

time. There were 89 hauls (58.6%) that employed two different types of hooks, with 13.0 circle hooks used most commonly as the second hook (100.0%). The average soak duration (the time from when the last hook entered the water until the first hook was hauled back) was 0.9 hr.

*ii) Catch and bycatch*

There were 16,158 individual animals caught on observed bottom longline hauls targeting reef fish in the Gulf of Mexico (Table 2). Teleosts comprised 96.3% of the catch, followed by sharks (3.5%), invertebrates (0.1%), and batoids (0.02%). Red grouper was the most frequently caught species of teleost (78.7%), and Atlantic sharpnose shark, *Rhizoprionodon terraenovae*, was the most frequently caught species of shark (1.7%). Small coastal shark species comprised 65.4% of the shark catch, large coastal shark species (excluding sandbar shark) comprised 17.3%, and deep water sharks comprised 11.3%. The sandbar shark represented 2.4% and the prohibited species, dusky shark, *Carcharhinus obscurus*, and bigeye sixgill shark, *Hexanchus vitulus*, made up 2.4% of the shark catch. Length frequencies of shark species are presented in Figure 2.

*iii) Protected species interactions*

One (1) loggerhead sea turtle, *Caretta caretta*, and one (1) laughing gull, *Larus autricilla*, were observed caught in bottom longline gear targeting reef fish in the Gulf of Mexico (Table 2). No sawfish or marine mammal interactions were observed.

*b) Gulf of Mexico and South Atlantic large coastal shark targeted trips (non-research shark fishery)*

*i) Gear and haul characteristics*

There were 13 hauls on 8 trips observed targeting large coastal shark in the Gulf of Mexico and South Atlantic. Trips averaged 2.0 sea days in length. The mainline length ranged from 3.9 to 22.6 km with an average of 11.8 km. The bottom depth fished ranged from 2.0 to 28.0 m with an average of 12.7 m, and the number of hooks ranged from 100 to 742 hooks with an average of 387.3 hooks fished. The most commonly used hook was the 20.0 circle hook (53.9%). There were ten hauls (76.9%) that employed two different types of hooks, with 18.0 circle hooks most frequently used as the second hook. The average soak duration was 12.0 hr.

*ii) Catch and bycatch*

There were 558 individual animals caught on observed bottom longline hauls targeting large coastal shark in the Gulf of Mexico and South Atlantic (Table 3). Sharks comprised 96.2% of the catch, followed by teleosts (2.5%), and batoids (1.3%). Large coastal shark species (excluding sandbar shark) comprised 48.7% of the shark catch, small coastal shark species comprised 47.7%, sandbar sharks comprised 3.2% and other prohibited sharks comprised 0.4% of the shark catch. Red drum, *Scianops ocellatus*, was the most frequently caught species of teleost (0.9%) and blacktip shark was the most frequently caught species of shark (22.6%). Length frequencies of shark species are presented in Figure 3.

*c) Gulf of Mexico and South Atlantic sandbar shark targeted trips (shark research fishery)*

*i) Gear and haul characteristics*

There were 211 hauls on 121 trips observed targeting sandbar sharks in the Gulf of Mexico and the South Atlantic. All of the trips targeted sandbar shark within the shark research fishery. Trips averaged 2.0 sea days in length. The mainline length ranged from 0.2 to 27.8 km with an average of 7.3 km. The bottom depth fished ranged from 2.0 to 122 m with an average of 438.4 m, and the number of hooks ranged from 4 to 654 hooks with an average of 230.0 hooks fished. The most commonly used hook was the 18.0 circle hook (46.92%) with 14.0 J hooks used in 22.27% of hauls. There were 32 hauls (15.1%) that employed two different types of hooks, with 20.0 circle hooks used most commonly as the second hook. The average soak duration was 11.6 hr.

*ii) Catch and bycatch*

There were 6,827 individual animals caught on observed bottom longline hauls targeting sandbar shark in the Gulf of Mexico and South Atlantic (Table 4). Sharks comprised 97.6% of the catch, followed by teleosts (1.9%) and batoids (0.4%). Large coastal shark species (excluding sandbar) comprised 41.4% of the shark catch, sandbar shark comprised 47.3%, small coastal shark species comprised 8.3%, deep water sharks comprised 0.8%, and pelagic sharks comprised 0.01%. Prohibited shark species were also caught including the dusky shark, the Caribbean reef shark, *Carcharhinus perezii*, the sand tiger shark, *Carcharias taurus*, and the great white shark, *Carcharodon carcharias* (2.1% of shark catch). King snake eel, *Ophichthus rex*, was the most frequently caught

species of teleost (0.6%) and sandbar shark was the most frequently caught species of shark (46.0%). Length frequencies of shark species are presented in Figure 4.

### *iii) Protected species interactions*

Interactions with protected resources were observed for bottom longline vessels fishing in the Gulf of Mexico and South Atlantic regions targeting sandbar shark (Table 4). Two (2) smalltooth sawfish and four (4) loggerhead sea turtles were observed caught in bottom longline gear targeting sandbar sharks. No sea bird or marine mammal interactions were observed.

## **Discussion**

In 2011, the shark bottom longline observer program covered vessels in the Gulf of Mexico and U.S. South Atlantic Ocean, with the majority of trips observed targeting sandbar shark in the shark research fishery. Research fishery data and biological samples collected through the shark research fishery continue to provide much needed life history information for stock assessment. For example, samples of vertebrae and reproductive tracts from over 650 blacktip sharks were collected by observers in 2006 - 2011 and data was used at the March stock assessment workshop for Gulf of Mexico blacktip sharks (SEDAR29-WP18 and SEDAR29-WP09). The Southeast Reef Fish Catch Shares Project also allowed for increased observer coverage in the bottom longline fishery and permitted the collection of otoliths and gonads for future reef fish stock assessments. Continued funding of these programs will provide for robust estimates of life history as well as provide an assessment on bycatch and release mortality levels of selected finfish species;

and provide data on temporal and spatial catch, release mortality, and bycatch species to the councils, state and federal regulatory agencies.

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Table 1. Number of vessels, trips, hauls, and hook hours observed in the Gulf of Mexico (GOM) and southern U.S. Atlantic Ocean (SA) for all target species. The total number of unique vessels is reported in brackets. Target species include reef fish (GRP), large coastal shark (SHX), and sandbar shark (SSB).

Area and Target	Vessels Observed	Trips Observed	Hauls Observed	Hook Hours
GOM GRP	8	10	241	153492.2
GOM/SA SSB	10	121	211	611726.0
GOM/SA SHX	5	8	13	56734.8
Total	23 (20)	139	465	821953.0

Table 2. Number caught (n) and disposition of catch in percentage for all observed hauls targeting reef fish in the Gulf of Mexico. Disposition of catch divided into kept (K), discard dead (DD), discard alive (DA), and unknown (U).

Scientific name	Common Name	n	% K	% DD	% DA	% U
<i>Epinephelus morio</i>	Red grouper	12719	47.5	8.2	43.4	0.9
<i>Lutjanus campechanus</i>	Red snapper	1110	41.2	2.9	55.9	0.0
<i>Epinephelus flavolimbatus</i>	Yellowedge grouper	307	99.0	1.0	0.0	0.0
<i>Rhizoprionodon terraenovae</i>	Atlantic sharpnose shark	278	2.2	25.9	71.9	0.0
<i>Urophycis floridana</i>	Southern hake	270	0.4	95.9	3.7	0.0
<i>Mycteroperca phenax</i>	Scamp grouper	247	95.2	2.4	2.0	0.4
<i>Mycteroperca microlepis</i>	Gag grouper	176	79.0	1.1	19.9	0.0
<i>Carcharhinus acronotus</i>	Blacknose shark	92	1.1	2.2	96.7	0.0
<i>Lopholatilus chamaeleonticeps</i>	Tilefish	90	10.0	0.0	90.0	0.0
<i>Seriola dumerili</i>	Greater amberjack	71	11.3	8.5	80.2	0.0
<i>Mustelus canis</i>	Smooth dogfish	59	1.7	3.4	93.2	1.7
<i>Pagrus pagrus</i>	Red porgy	47	49.0	25.5	25.5	0.0
<i>Epinephelus drummondhayi</i>	Speckled hind	44	66.0	6.8	22.7	4.5
<i>Lutjanus analis</i>	Mutton snapper	38	100.0	0.0	0.0	0.0
<i>Lutjanus griseus</i>	Gray snapper	35	82.9	5.7	11.4	0.0
<i>Seriola rivoliana</i>	Almaco jack	33	69.7	3.0	27.3	0.0
<i>Galeocerdo cuvier</i>	Tiger shark	32	6.3	3.1	87.5	3.1
<i>Opsanus pardus</i>	Leopard toadfish	29	3.4	65.6	24.1	6.9
<i>Carcharhinus falciformis</i>	Silky shark	28	10.7	42.9	46.4	0.0
<i>Sphyrna lewini</i>	Scalloped hammerhead shark	26	3.8	11.5	84.7	0.0
<i>Echeneis naucrates</i>	Sharksucker	25	0.0	0.0	100.0	0.0
<i>Lutjanus synagris</i>	Lane snapper	25	20.0	8.0	72.0	0.0
<i>Rhomboplites aurorubens</i>	Vermillion snapper	25	64.0	12.0	24.0	0.0
<i>Calamus bajonado</i>	Jolthead porgy	19	89.5	10.5	0.0	0.0
<i>Ophichthus rex</i>	King snake eel	19	0.0	100.0	0.0	0.0
<i>Remora remora</i>	Remora	16	6.3	25.0	68.7	0.0
<i>Muraenidae</i>	Moray eel family	15	0.0	86.6	6.7	6.7
<i>Sphyrna barracuda</i>	Great barracuda	15	6.7	79.9	6.7	6.7
<i>Carcharhinus plumbeus</i>	Sandbar shark	14	7.1	0.0	92.9	0.0
<i>Seriola zonata</i>	Banded rudderfish	14	0.0	42.9	57.1	0.0
<i>Rachycentron canadum</i>	Cobia	13	46.2	7.6	46.2	0.0
<i>Synodus foetens</i>	Inshore lizardfish	12	0.0	83.3	16.7	0.0
<i>Gymnothorax funebris</i>	Green moray eel	10	0.0	100.0	0.0	0.0
<i>Hexanchus vitulus</i>	Bigeye sixgill shark	9	0.0	55.6	44.4	0.0
<i>Trachinocephalus myops</i>	Snakefish	9	0.0	66.7	33.3	0.0
<i>Holocentrus</i> sp.	Squirrelfishes	8	0.0	0.0	87.5	12.5
<i>Mycteroperca bonaci</i>	Black grouper	8	100.0	0.0	0.0	0.0
<i>Diplectrum formosum</i>	Sand perch	7	0.0	28.6	71.4	0.0
<i>Ginglymostoma cirratum</i>	Nurse shark	7	0.0	0.0	85.7	14.3
<i>Carcharhinus brevipinna</i>	Spinner shark	6	0.0	16.7	83.3	0.0
<i>Elasmobranchii</i>	Sharks	6	16.7	0.0	83.3	0.0
<i>Euthynnus alletteratus</i>	Little tunny	6	0.0	100.0	0.0	0.0
<i>Sarda sarda</i>	Bonito	6	16.7	83.3	0.0	0.0
<i>Seriola</i> sp.	Amberjacks	6	16.7	83.3	0.0	0.0
<i>Squalus</i> sp.	Spiny dogfish	6	0.0	66.7	33.3	0.0

Table 2. cont'd

Scientific name	Common Name	n	% K	% DD	% DA	% U
<i>Synodus intermedius</i>	Sanddiver lizardfish	6	0.0	16.7	83.3	0.0
<i>Astroidea</i>	Sea stars	5	40.0	0.0	60.0	0.0
<i>Balistes caprisus</i>	Gray triggerfish	5	80.0	0.0	20.0	0.0
<i>Carcharhinus isodon</i>	Finetooth shark	5	0.0	20.0	80.0	0.0
<i>Carcharhinus obscurus</i>	Dusky shark	5	0.0	0.0	100.0	0.0
<i>Coryphaena hippurus</i>	Dolphinfish	5	80.0	20.0	0.0	0.0
<i>Seriola fasciata</i>	Lesser amberjack	5	0.0	40.0	60.0	0.0
<i>Sparidae</i>	Porgy family	5	100.0	0.0	0.0	0.0
<i>Urophycis cirrata</i>	Gulf hake	5	0.0	40.0	20.0	40.0
<i>Anthozoa</i>	Coral	4	0.0	50.0	50.0	0.0
<i>Centropristis ocyurus</i>	Bank seabass	4	0.0	25.0	75.0	0.0
<i>Serranidae</i>	Seabass family	4	0.0	75.0	25.0	0.0
<i>Synodontidae</i>	Lizardfish family	4	0.0	100.0	0.0	0.0
<i>Acanthocybium solanderi</i>	Wahoo	3	33.3	66.7	0.0	0.0
<i>Calappa flammea</i>	Flame box crab	3	0.0	0.0	100.0	0.0
<i>Epinephelus niveatus</i>	Snowy grouper	3	100.0	0.0	0.0	0.0
<i>Malacanthus plumieri</i>	Sand tilefish	3	0.0	33.3	66.7	0.0
<i>Thunnus obesus</i>	Bigeye tuna	3	33.3	66.7	0.0	0.0
<i>Caulolatilus microps</i>	Blueline tilefish	2	0.0	0.0	100.0	0.0
<i>Epinephelus adscensionis</i>	Rock hind	2	100.0	0.0	0.0	0.0
<i>Merluccius</i> sp.	Hakes	2	100.0	0.0	0.0	0.0
<i>Neomerinthe hemingwayi</i>	Spinycheek scorpionfish	2	100.0	0.0	0.0	0.0
<i>Paralichthys lethostigma</i>	Southern flounder	2	100.0	0.0	0.0	0.0
<i>Paralichthys</i> sp.	Flounders	2	0.0	50.0	50.0	0.0
<i>Porifera</i>	Sponges	2	0.0	100.0	0.0	0.0
<i>Auxis thaza</i>	Frigate mackerel	1	0.0	100.0	0.0	0.0
<i>Caranx hippos</i>	Crevale jack	1	0.0	100.0	0.0	0.0
<i>Caretta caretta</i>	Loggerhead sea turtle	1	0.0	0.0	100.0	0.0
<i>Centropristis philadelphia</i>	Rock seabass	1	0.0	100.0	0.0	0.0
<i>Cephalopoda</i>	Octopus	1	0.0	100.0	0.0	0.0
<i>Congridae</i>	Conger eels	1	0.0	100.0	0.0	0.0
<i>Dasyatis americana</i>	Southern stingray	1	0.0	100.0	0.0	0.0
<i>Dasyatis</i> sp.	Stingrays	1	0.0	100.0	0.0	0.0
<i>Decapoda</i>	Crabs	1	0.0	0.0	0.0	100.0
<i>Elagatis bipinnulata</i>	Rainbow runner	1	0.0	100.0	0.0	0.0
<i>Epinephelus nigritus</i>	Warsaw grouper	1	100.0	0.0	0.0	0.0
<i>Gymnothorax moring</i>	Spotted moray eel	1	0.0	100.0	0.0	0.0
<i>Gymnothorax saxicola</i>	Ocellated moray eel	1	0.0	100.0	0.0	0.0
<i>Gymnothorax vicinus</i>	Purplemouth moray eel	1	0.0	100.0	0.0	0.0
<i>Haemulon album</i>	Margate grunt	1	100.0	0.0	0.0	0.0
<i>Lagocephalus laevis</i>	Smooth puffer	1	0.0	0.0	100.0	0.0
<i>Lagocephalus lagocephalus</i>	Oceanic puffer	1	0.0	0.0	100.0	0.0
<i>Larus auricilla</i>	Laughing gull	1	0.0	100.0	0.0	0.0
<i>Lutjanidae</i>	Snappers	1	0.0	100.0	0.0	0.0
<i>Lutjanus vivanus</i>	Silk snapper	1	100.0	0.0	0.0	0.0
<i>Manta birostris</i>	Manta ray	1	100.0	0.0	0.0	0.0

Table 2. cont'd

<b>Scientific name</b>	<b>Common Name</b>	<b>n</b>	<b>% K</b>	<b>% DD</b>	<b>% DA</b>	<b>% U</b>
<i>Muraena retifera</i>	Reticulate moray eel	1	0.0	100.0	0.0	0.0
<i>Mycteroperca interstitialis</i>	Yellowmouth grouper	1	100.0	0.0	0.0	0.0
<i>Osteichthyes</i>	Unknown teleost	1	0.0	100.0	0.0	0.0
<i>Polychaeta</i>	Worms	1	0.0	0.0	100.0	0.0
<i>Pomatomus saltatrix</i>	Bluefish	1	0.0	100.0	0.0	0.0
<i>Scomberomorus cavalla</i>	King mackerel	1	0.0	100.0	0.0	0.0
<i>Scyphozoa</i>	Jellyfish	1	0.0	0.0	100.0	0.0
<i>Tetraodontidae</i>	Puffer family	1	0.0	0.0	100.0	0.0
Unknown animal	Unknown animal	1	0.0	0.0	100.0	0.0

Table 3. Number caught (n) and disposition of catch in percentage for all observed hauls targeting large coastal shark in the Gulf of Mexico and South Atlantic. Disposition of catch divided into kept (K), discard dead (DD), discard alive (DA), and unknown (U).

Scientific Name	Common Name	n	% K	% DD	% DA	% U
<i>Carcharhinus limbatus</i>	Blacktip shark	126	69.0	29.4	0.8	0.8
<i>Rhizoprionodon terraenovae</i>	Atlantic sharpnose shark	125	55.2	44.8	0.0	0.0
<i>Carcharhinus acronotus</i>	Blacknose shark	78	78.2	21.8	0.0	0.0
<i>Carcharhinus leucas</i>	Bull shark	39	100.0	0.0	0.0	0.0
<i>Sphyrna tiburo</i>	Bonnethead shark	37	59.5	40.5	0.0	0.0
<i>Galeocerdo cuvier</i>	Tiger shark	25	40.0	20.0	24.0	16.0
<i>Negaprion brevirostris</i>	Lemon shark	23	100.0	0.0	0.0	0.0
<i>Ginglymostoma cirratum</i>	Nurse shark	19	0.0	0.0	100.0	0.0
<i>Carcharhinus brevipinna</i>	Spinner shark	17	11.8	88.2	0.0	0.0
<i>Carcharhinus plumbeus</i>	Sandbar shark	17	0.0	47.1	52.9	0.0
<i>Carcharhinus isodon</i>	Finetooth shark	16	93.7	6.3	0.0	0.0
<i>Sphyrna mokarran</i>	Great hammerhead shark	12	100.0	0.0	0.0	0.0
<i>Dasyatis sabina</i>	Atlantic stingray	5	100.0	0.0	0.0	0.0
<i>Scianops ocellatus</i>	Red drum	5	0.0	0.0	100.0	0.0
<i>Epinephelus morio</i>	Red grouper	3	0.0	0.0	100.0	0.0
<i>Carcharias taurus</i>	Sand tiger shark	2	0.0	0.0	100.0	0.0
<i>Gymnothorax funebris</i>	Green moray eel	2	0.0	100.0	0.0	0.0
<i>Bagre marinus</i>	Gafftopsail catfish	1	0.0	0.0	100.0	0.0
<i>Dasyatis americana</i>	Southern stingray	1	0.0	0.0	100.0	0.0
<i>Muraenidae</i>	Moray eel family	1	0.0	100.0	0.0	0.0
<i>Mycteroperca microlepis</i>	Gag grouper	1	0.0	0.0	100.0	0.0
<i>Opsanus pardus</i>	Leopard toadfish	1	0.0	0.0	100.0	0.0
<i>Rajiformes</i>	Skates and rays	1	0.0	0.0	100.0	0.0
<i>Sphyrna lewini</i>	Scalloped hammerhead shark	1	0.0	100.0	0.0	0.0

Table 4. Number caught (n) and disposition of catch in percentage for all observed hauls targeting sandbar shark in the Gulf of Mexico and South Atlantic. Disposition of catch divided into kept (K), discard dead (DD), discard alive (DA), and unknown (U).

Scientific Name	Common Name	n	% K	% DD	% DA	% U
<i>Carcharhinus plumbeus</i>	Sandbar shark	3141	87.4	2.8	9.1	0.7
<i>Carcharhinus limbatus</i>	Blacktip shark	765	69.1	23.4	6.8	0.7
<i>Galeocerdo cuvier</i>	Tiger shark	561	42.8	5.9	49.3	2.0
<i>Rhizoprionodon terraenovae</i>	Atlantic sharpnose shark	430	37.9	58.6	3.5	0.0
<i>Ginglymostoma cirratum</i>	Nurse shark	373	1.6	0.3	97.6	0.5
<i>Carcharhinus leucas</i>	Bull shark	313	88.2	0.3	9.9	1.6
<i>Sphyrna lewini</i>	Scalloped hammerhead shark	307	90.2	7.5	1.6	0.7
<i>Carcharhinus brevipinna</i>	Spinner shark	190	62.1	27.9	10.0	0.0
<i>Sphyrna mokarran</i>	Great hammerhead shark	129	81.3	17.1	1.6	0.0
<i>Carcharhinus acronotus</i>	Blacknose shark	127	77.1	21.3	1.6	0.0
<i>Carcharhinus obscurus</i>	Dusky shark	107	5.6	45.8	46.7	1.9
<i>Negaprion brevirostris</i>	Lemon shark	91	91.2	0.0	8.8	0.0
<i>Mustelus canis</i>	Smooth dogfish	52	65.4	34.6	0.0	0.0
<i>Ophichthus rex</i>	King snake eel	41	14.6	85.4	0.0	0.0
<i>Carcharias taurus</i>	Sand tiger shark	32	0.0	0.0	96.9	3.1
<i>Epinephelus morio</i>	Red grouper	21	23.8	23.8	52.4	0.0
<i>Carcharhinus falciformis</i>	Silky shark	17	47.1	47.1	5.8	0.0
<i>Dasyatis</i> sp.	Stingrays	10	10.0	30.0	60.0	0.0
<i>Epinephelus itajara</i>	Goliath grouper	10	0.0	0.0	100.0	0.0
<i>Seriola dumerili</i>	Greater amberjack	10	70.0	30.0	0.0	0.0
<i>Lutjanus campechanus</i>	Red snapper	9	44.4	55.6	0.0	0.0
<i>Dasyatis americana</i>	Southern stingray	8	0.0	0.0	100.0	0.0
<i>Carcharhinus isodon</i>	Finetooth shark	6	100.0	0.0	0.0	0.0
<i>Scianops ocellatus</i>	Red drum	6	0.0	16.7	83.3	0.0
<i>Carcharhinus perezii</i>	Caribbean reef shark	5	0.0	80.0	20.0	0.0
<i>Dasyatis centroura</i>	Roughtail stingray	5	40.0	0.0	60.0	0.0
<i>Caretta caretta</i>	Loggerhead sea turtle	4	0.0	75.0	25.0	0.0
<i>Lutjanus analis</i>	Mutton snapper	4	100.0	0.0	0.0	0.0
<i>Trichiurus lepturus</i>	Atlantic cutlassfish	4	100.0	0.0	0.0	0.0
<i>Elasmobranchii</i>	Sharks	3	0.0	0.0	66.7	33.3
<i>Rachycentron canadum</i>	Cobia	3	66.7	0.0	33.3	0.0
<i>Serranidae</i>	Seabass family	3	33.3	66.7	0.0	0.0
<i>Sphyrna tiburo</i>	Bonnethead shark	3	33.3	66.7	0.0	0.0
<i>Aetobatis narinari</i>	Spotted eagle ray	2	0.0	0.0	100.0	0.0
<i>Coryphaena hippurus</i>	Dolphinfish	2	50.0	50.0	0.0	0.0
<i>Gymnothorax moring</i>	Spotted moray eel	2	0.0	100.0	0.0	0.0
<i>Myliobatis freminvillei</i>	Bullnose ray	2	0.0	100.0	0.0	0.0
<i>Ophichthus ocellatus</i>	Pale-spotted eel	2	0.0	50.0	50.0	0.0
<i>Pristis pectinata</i>	Smalltooth sawfish	2	0.0	0.0	100.0	0.0
<i>Raja eglanteria</i>	Clearnose skate	2	50.0	50.0	0.0	0.0
<i>Sphyrna barracuda</i>	Great barracuda	2	0.0	50.0	50.0	0.0
<i>Squatina dumeril</i>	Atlantic angel shark	2	0.0	0.0	100.0	0.0
<i>Synodus foetens</i>	Inshore lizardfish	2	0.0	50.0	50.0	0.0
<i>Carcharodon carcharias</i>	Great white shark	1	0.0	100.0	0.0	0.0

Table 4. cont'd

<b>Scientific Name</b>	<b>Common Name</b>	<b>n</b>	<b>% K</b>	<b>% DD</b>	<b>% DA</b>	<b>% U</b>
<i>Congridae</i>	Conger eels	1	0.0	100.0	0.0	0.0
<i>Dasyatis sabina</i>	Atlantic stingray	1	0.0	100.0	0.0	0.0
<i>Echeneidae</i>	Remora family	1	100.0	0.0	0.0	0.0
<i>Echeneis naucrates</i>	Sharksucker	1	0.0	0.0	100.0	0.0
<i>Epinephelus niveatus</i>	Snowy grouper	1	0.0	100.0	0.0	0.0
<i>Gymnothorax funebris</i>	Green moray eel	1	0.0	100.0	0.0	0.0
<i>Isurus oxyrinchus</i>	Shortfin mako shark	1	100.0	0.0	0.0	0.0
<i>Manta birostris</i>	Manta ray	1	0.0	0.0	100.0	0.0
<i>Menticirrhus americanus</i>	Southern kingfish	1	0.0	100.0	0.0	0.0
<i>Micropogonias undulatus</i>	Atlantic croaker	1	0.0	100.0	0.0	0.0
<i>Muraena retifera</i>	Reticulate moray eel	1	0.0	100.0	0.0	0.0
<i>Muraenidae</i>	Moray eel family	1	0.0	100.0	0.0	0.0
<i>Opsanus pardus</i>	Leopard toadfish	1	0.0	0.0	100.0	0.0
<i>Pomatomus saltatrix</i>	Bluefish	1	0.0	100.0	0.0	0.0
<i>Seriola rivoliana</i>	Almaco jack	1	100.0	0.0	0.0	0.0
<i>Urophycis floridana</i>	Southern hake	1	100.0	0.0	0.0	0.0

Figure 1. Distribution of all observed hauls by target in the Gulf of Mexico and U.S. Atlantic Ocean in 2011. (a) Frequency of sets targeting reef fish

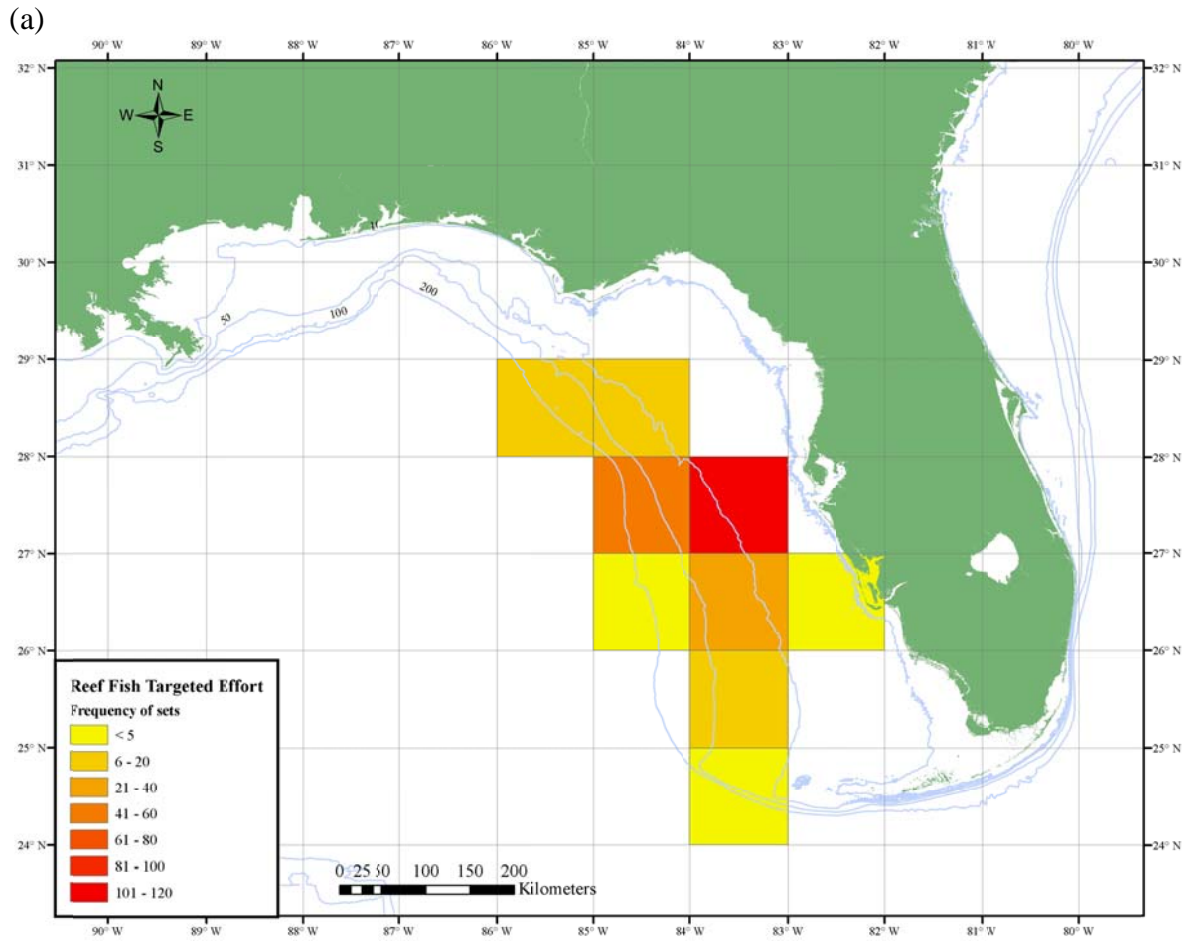
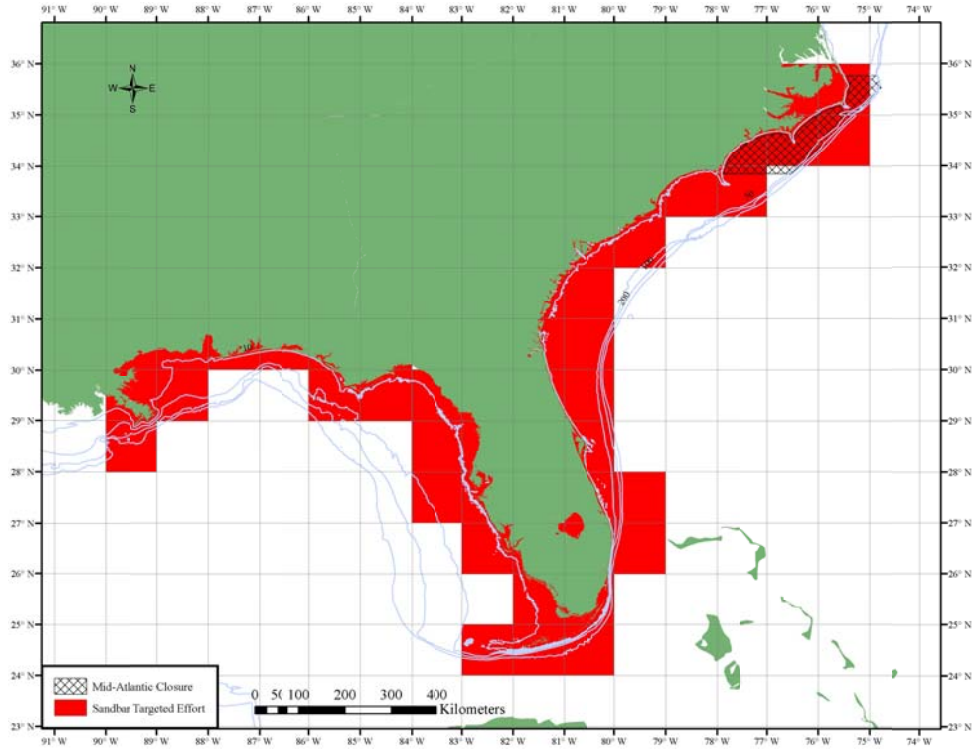


Figure 1 cont'd. Distribution of all observed hauls by target in the Gulf of Mexico and U.S. Atlantic Ocean in 2011. Frequency of sets not reported due to confidentiality considerations. (b) Distribution of effort targeting sandbar shark, (c) distribution of effort targeting large coastal sharks.

(b)



(c)

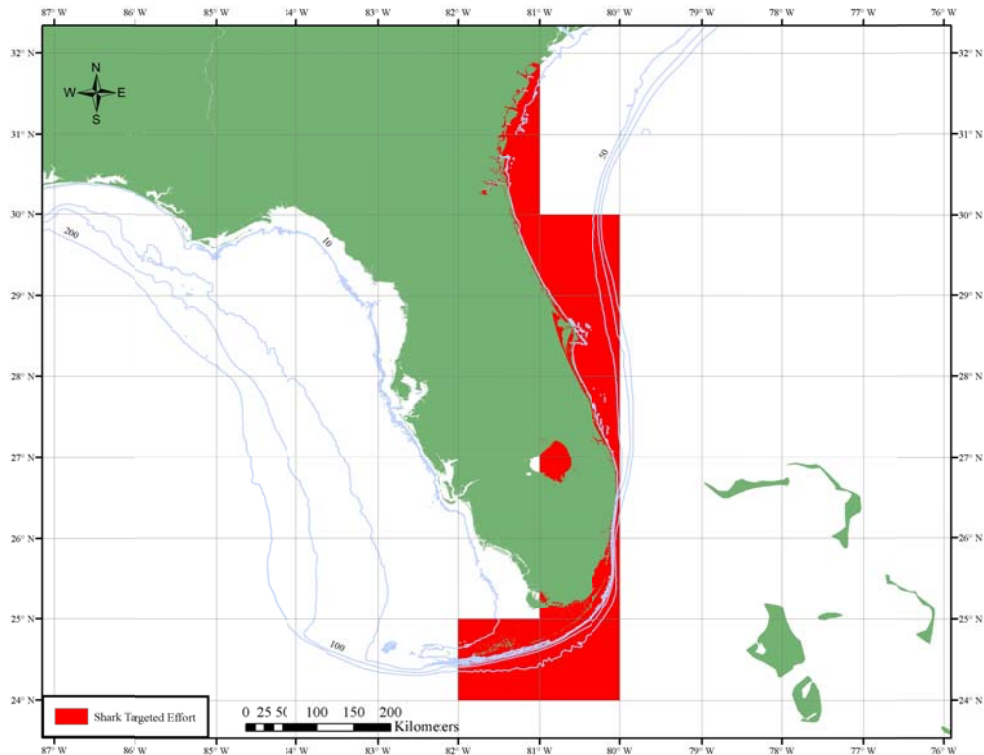
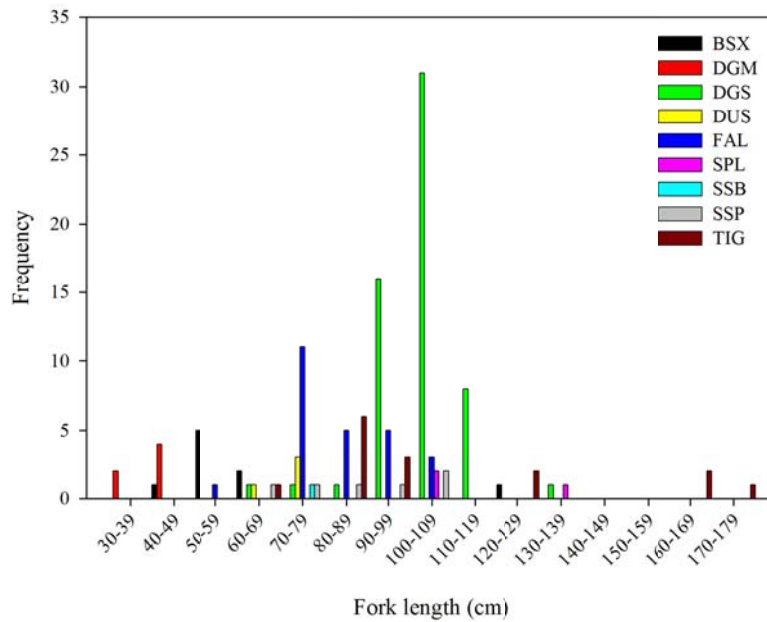


Figure 2. Length frequency (cm fork length) of (a) bigeye sixgill (BSX), shortspine dogfish (DGM), smooth dogfish (DGS), dusky (DUS), silky (FAL), scalloped hammerhead (SPL), sandbar (SSB), spinner (SSP) and tiger (TIG) sharks, (b) small coastal sharks including Atlantic sharpnose (SAS) and blacknose (SBN) sharks observed caught on bottom longline sets targeting reef fish in the Gulf of Mexico and U.S. Atlantic Ocean.

(a)



(b)

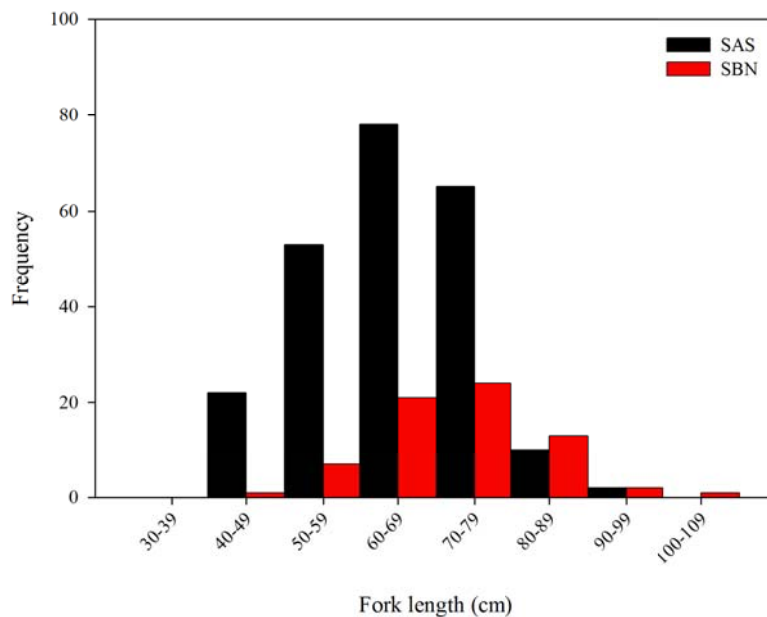
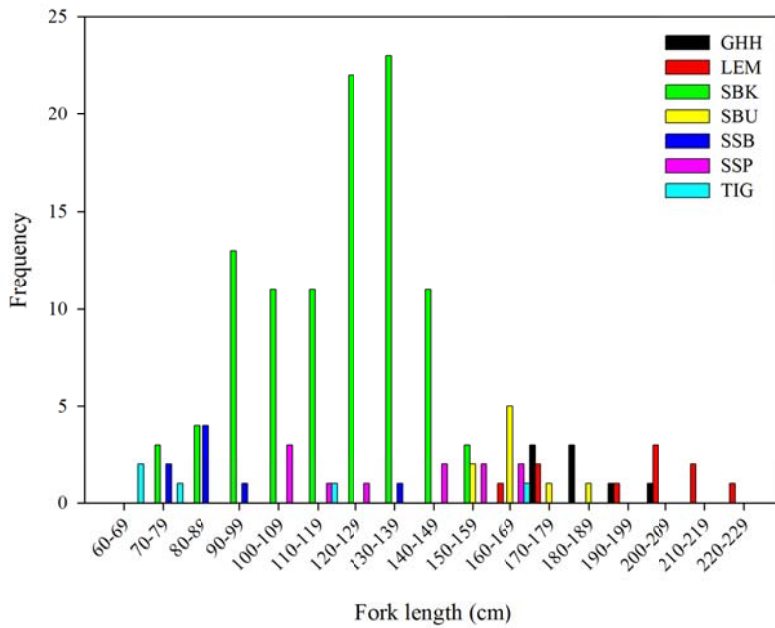


Figure 3. Length frequency (cm fork length) of (a) great hammerhead (GHH), lemon (LEM), blacktip (SBK), bull (SBU), sandbar (SSB), and spinner (SSP) and tiger (TIG) sharks, (b) small coastal sharks including bonnethead (BHH), Atlantic sharpnose (SAS), blacknose (SBN) sharks and finetooth (SFT) sharks observed caught on bottom longline sets targeting large coastal shark in the Gulf of Mexico and U.S. Atlantic Ocean.



(b)

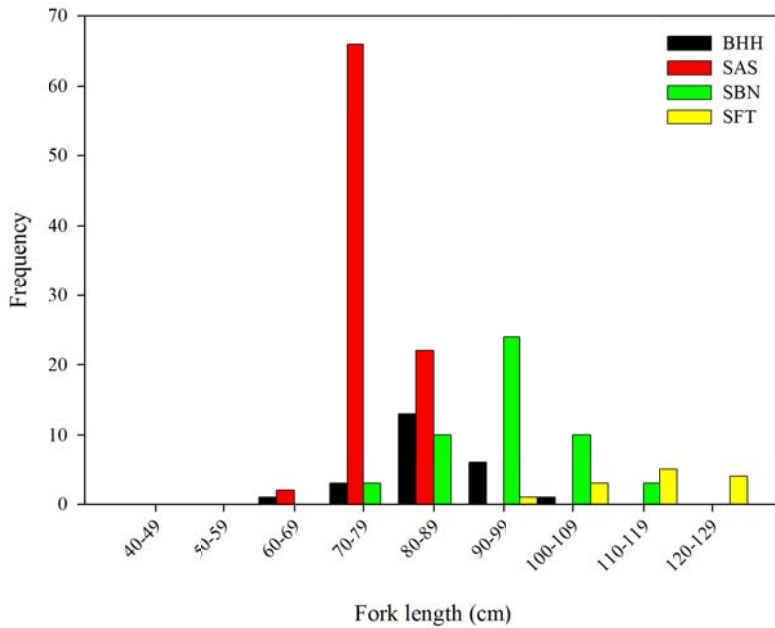
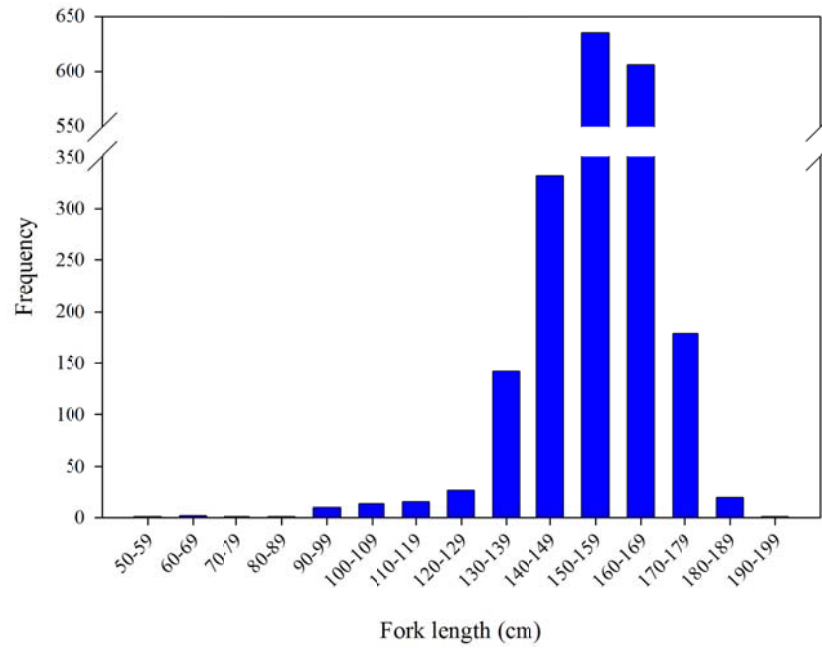


Figure 4. Length frequency (cm fork length) of (a) sandbar sharks, (b) small coastal sharks including Bonnethead (BHH), Atlantic sharpnose (SAS), blacknose (SBN) and finetooth (SFT) sharks observed caught on bottom longline sets targeting sandbar shark in the Gulf of Mexico and U.S. Atlantic Ocean.

(a)



(b)

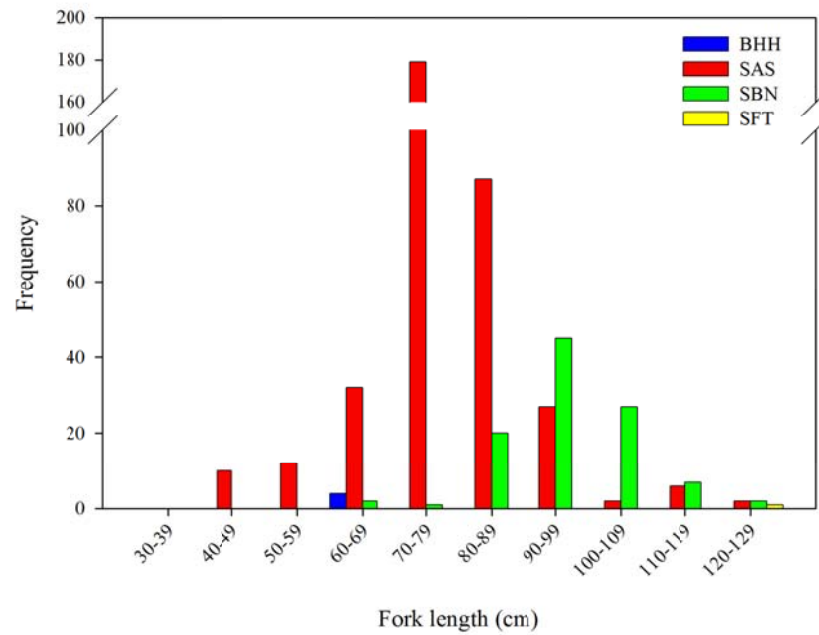
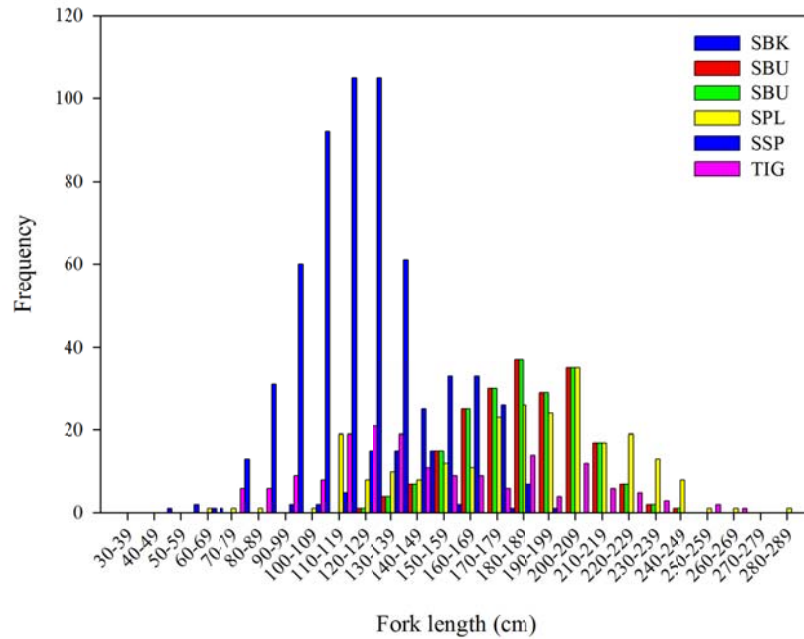


Figure 4 cont'd. Length frequency (cm fork length) of large coastal sharks including (c) blacktip (SBK), bull (SBU), scalloped hammerhead (SPL), spinner (SSP) and tiger (TIG) sharks, (d) silky (FAL), great hammerhead (GHH), lemon (LEM) and nurse (NUR) sharks observed caught on bottom longline sets targeting sandbar shark in the Gulf of Mexico and U.S. Atlantic Ocean.

(c)



(d)

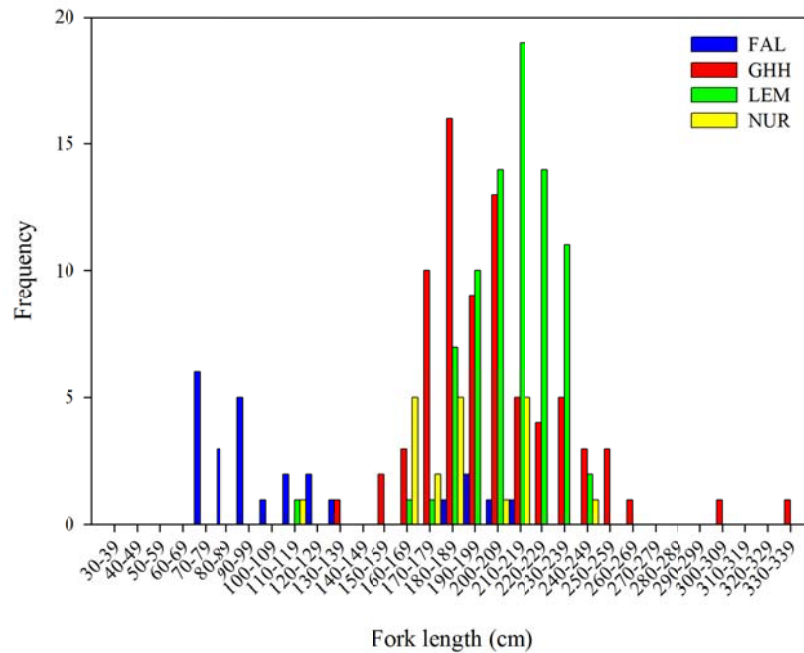
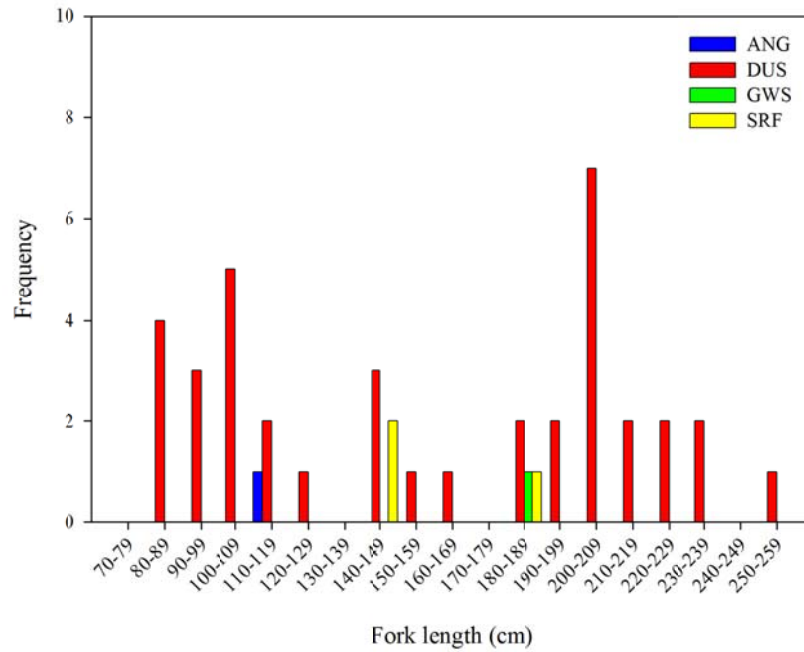


Figure 4 cont'd. Length frequency (cm fork length) of (e) prohibited sharks including angel (ANG), dusky (DUS), white (GWS) and Caribbean reef (SRF) sharks, (f) smooth dogfish (DGS) and shortfin mako (SMA) sharks observed caught on bottom longline sets targeting sandbar shark in the Gulf of Mexico and U.S. Atlantic Ocean.

(e)



(f)

